

## 5 EXECUTIVE PUBLISHABLE SUMMARY, RELATED TO THE OVERALL PROJECT DURATION

<b>Contract No</b>	NNE5/340/2001	<b>Project Duration</b>	48 months
<b>Title</b>	<b>Renewable Energy Systems for Urban ReGENERation in Cities of Europe</b>		
<b>Objectives:</b>			
<b>Scientific achievements:</b>			
<ul style="list-style-type: none"> <li>▪ Installation of over 1.3 MWp of photovoltaics in social housing and community buildings in the five participating countries – Denmark, Germany, Netherlands, Switzerland and the U.K.</li> <li>▪ Extended programme of monitoring of the social acceptance of PV in social housing, including measurement of the tangible benefits delivered to residents, monitoring effects on attitudes towards reduction of energy use and renewable energy and the perceptions of the impact PV has on enhancement of the environment.</li> <li>▪ Detailed technical monitoring of performance of installations, including full analytical monitoring (following the “Guidelines for the Assessment of Photovoltaic Plants” published by the JRC of the European Commission) of one installation per country.</li> <li>▪ Attempt at an international joint procurement exercise, aimed at procuring modules for multiple Resurgence installations in several countries via a single tender. The intention of this was to assess the potential for cost reduction through bulk procurement. This initiative was not successful due to a limited response and unattractive price offers from those companies that did respond. The main reason given for non-response and for the lack of price reduction was the difficulties of supplying across national borders during a short time-scale. This may be indicative of a lack of maturity of the PV market in certain countries. Nonetheless, there was some success at achieving cost reductions through bulk procurement at a national level, e.g. in Switzerland and Denmark.</li> <li>▪ Resurgence funding was used to successfully leverage substantial additional funding from national programmes to support implementation of PV, e.g. the capital grant schemes that operated in the U.K and the Netherlands.</li> <li>▪ The Resurgence contract has enabled the expansion of the Sol1000 programme in Denmark (despite a cut in national government support), enabling more systems to be installed and more in-depth programmes of technical and social monitoring to be undertaken.</li> <li>▪ Best-practice financing mechanisms to support the uptake of PV have been investigated through the Resurgence project. These include regulatory incentives such as the German feed-in law or Renewables Obligation in the U.K, but also include more innovative commercially driven mechanisms. An example of this is the Copenhagen Solar Stock Exchange, which was implemented during the Resurgence project following cooperation between Danish and Swiss partners (following an existing model operating in Zurich). Under the Solar Stock Exchange, the Utility Copenhagen Energy offers customers a green electricity tariff, whereby they will pay a higher charge for a portion of their electricity. The proceeds from this are used to offer PV investors installing systems in the area an attractive feed-in tariff. Several investment cooperatives have been established to install PV and take advantage of the feed-in tariff. This is a market based mechanism, as the level of tariff depends on uptake of the green tariff for retail electricity, i.e the uptake of PV is determined by the demand for green electricity.</li> <li>▪ The target system cost set in the EC contract was 6 EUR/Wp. In practice, the average cost of the installations is approximately 6 EUR/Wp, although several of the more integrated systems were more expensive. The most expensive installation involved PV integrated into solar shading louvers at Studenthouse in Copenhagen (&gt;9 EUR/Wp) and the lowest cost installation was also in Denmark, where low cost installations in the Sol 1000 programme were installed at a cost of 4.4 EUR/Wp.</li> <li>▪ Dissemination – the main forum for dissemination of the Resurgence project is the website, <a href="http://www.resurgence.info">www.resurgence.info</a>, which contains a wealth of information about the installed projects and access to the best practice reports that have resulted from studies into social, building, financial and electrical integration of PV.</li> <li>▪ In addition to the work package reports and periodic technical reports, the results of the Resurgence project have been disseminated widely through magazine articles, peer</li> </ul>			



reviewed articles and presentations at international conference meetings of the PV industry.

#### **Main deliverables:**

- Installation and commissioning of 1.3 MWp of photovoltaics in social housing and community buildings in the five participating countries.
- 1 year of technical monitoring, including full analytical monitoring of 1 installation per country in accordance with the “Guidelines for the Assessment of Photovoltaic Plants” published by the JRC of the European Commission. A database of all monitored data has been compiled and an internet-based information service set-up to allow online access to Resurgence monitoring data.
- Monitoring of the social impact of PV installations (energy-consciousness, neighbourhood pride etc.) among the residents’ communities at the project sites. Monitoring was conducted via questionnaires developed during the Resurgence project.
- Development of best-practice guidelines for financing of PV installations and trade of electricity generated. The methods identified in this report have been put into practice in the Resurgence installations, including leverage of national capital grant funding, accessing production incentives (e.g. the Priors Estate array was the first PV project in the U.K to gain accreditation under the Renewables Obligation scheme) and development of more innovative financing mechanisms such as the Copenhagen Solar Stock Exchange and PV Co-Operatives.
- Demonstration of the opportunity for price reductions through bulk procurement at a national level (an attempt at wider common procurement, involving supply of systems components to projects in multiple countries was unsuccessful).
- Broad dissemination of project results through the project website [www.resurgence.info](http://www.resurgence.info), and through a variety of magazine articles, peer reviewed papers and conference presentations.

#### **Socio-economic relevance and policy implications:**

The project has aimed to tackle the 3 major hurdles that must be overcome for the widespread uptake of PV – reduction in capital cost, increased regulatory incentives and increased public awareness and acceptance.

**Capital cost reduction** – The project set a target cost of installation at 6 EUR/Wp. Many of the systems utilising simple integration systems fell within this target, but in general the more integrated systems were more expensive. At these cost levels, the installation of PV is only financially feasible with grant support or if a favourable feed-in tariff exists. Continued support is required to ensure continued growth of the industry.

**Regulatory incentives** - A range of regulatory mechanisms are in place to support PV in the Resurgence countries. The most effective is the feed-in tariff that operates in Germany. The system of green certificates, such as the Renewables Obligation in the U.K, does lend support to PV, but tends to be less effective as it can favour lower capital cost technologies. The same is true of the capital grant schemes, where the trend appears to be towards non-technology specific support. From the consumer side, regulations need to be simplified such that it is easy to connect to PV systems to local electricity grids. Net-metering would also be an effective means of incentivising consumers.

**Public awareness/acceptance** – The project has shown a high level of concern about environmental issues and appreciation of the need to reduce CO<sub>2</sub> emissions among social housing residents. The social monitoring has also indicated a positive response towards PV, from the point of view of neighbourhood pride. This is encouraging, as the uptake of PV will in the end be strongly dependent on public attitudes.

#### **Conclusions:**

The direct benefits, e.g. financial, that the Resurgence PV installations have delivered to residents of the affected estates has been limited. There have been a number of reasons for this.

- In some countries and under certain market conditions it is simply more economic to export electricity directly to the grid, e.g. where there is a feed-in tariff.
- A number of obstacles to supply of electricity to tenants have been encountered.



Supplying electricity directly to tenants (i.e. feeding electricity on the consumer side of the meter to offset their import) can be technically difficult, particularly in retro-fits, and raises concerns for social landlords over the equal treatment of tenants. Social landlords are unwilling to become electricity suppliers to their tenants, due to the administrative burden entailed in billing and because penalties for non-payment of billing (e.g. disconnection of supply) may not be compatible with their duty of care. The result is that PV electricity tends only to be used for landlord's supplies, e.g. communal lighting. Tenants pay for this in their service charge.

There is evidence that installation of PV in social housing by third-party investors can be mutually beneficial for the investment company and the housing association. The investor has access to a large stock of buildings with potentially suitable roof space and the housing association are able to derive a revenue from their roof spaces (e.g. a rental charge). The Resurgence project has shown that the social housing groups and other community based investment vehicles can be interested in taking advantage of this, if the local market conditions can provide an attractive return on investment (an attractive rate of return to a community-based investment vehicle may be lower than that expected by a commercial investor). The advantages delivered to tenants under these models are indirect, e.g. perception of an enhanced environment and raised awareness of environmental issues.

There is evidence that cost reductions can be obtained through bulk procurement, at least at a national level. For example, Danish partner Energi-Midt obtained a cost of 4.4 €/Wp in the Sol-1000 programme by bulk procurement, via an international tender. The Swiss partner Edisun Power believe that a 3-5% price reduction was obtained by procurement of over 150 kW of modules in 2003. The capacity required to access such price reductions have risen over the course of the Resurgence project and it is now believed that orders of 500 kW to 1MW are required.

#### **Dissemination of results:**

The results of the Resurgence project have been demonstrated widely. The target groups for dissemination of resurgence results are social landlords, utilities and potential PV investors. The results have also been made accessible to engineers, architects and more widely to the PV industry.

The main forum for presenting information about the projects is the website, [www.resurgence.info](http://www.resurgence.info). This site contains details of all installed projects, monitoring results and work package reports on building, electrical, financial and social integration of PV within the social housing sector and in community buildings.

In addition, the results of the project have been presented at several international PV conferences and in a number of articles published in peer reviewed journals. Furthermore, a host of magazine articles about the project have been published in the Resurgence countries. A book, 'PV & Architecture' has recently been published in Denmark (in Danish, although an English version will follow shortly) which includes many of the Danish Resurgence installations. These installations would not have been installed without Resurgence funding. The Building Integration work package report provided significant source material to this publication.

